THE BRAIN:

ITS DEVELOPMENT, ARCHITECTURE, FUNCTIONS AND EDUCATION.

A LECTURE

Delivered in the Assembly Rooms, Grahamstown, on 18th May, 1892,

BY

T. DUNCAN GREENLEES,

M.B. Edin., J.P.,

Medical Superintendent, Grahamstown Asylum.

Reprinted from "The Journal."

GRAHAMSTOWN:

J. SLATER, PRINTER, &C., "THE JOURNAL" OFFICE.

1892.

THE BRAIN:

ITS DEVELOPMENT, ARCHITECTURE, FUNCTIONS AND EDUCATION.

A LECTURE

Delivered in the Assembly Rooms, Grahamstown, on 18th May, 1892,

BY

T. DUNCAN GREENLEES,

M.B. Edin., J.P.,

Medical Superintendent, Grahamstown Asylum.

Reprinted from "The Journal."

GRAHAMSTOWN:

J. Slater, Printer, &c., "The Journal" Office.

1892.

THE BRAIN:

Its Development, Architecture, Functions and Education.

Mr. Chairman, Ladies and Gentlemen, —We are met here this evening for the purpose of studying the Brain, its structure, functions and education, and the objects of our meeting are twofold. In the first place perhaps some of you may have some laudable curiosity as to the nature of this organ called the brain, and I am here to satisfy this craving for knowledge. In the second place we appeal to your liberality to assist in supporting the Entertainment fund connected with the Chronic Sick Hospital in this City. You all know this institution—many of you intimately. Regarding the objects of its existence—its *raison d'etre*—some of you may only have hazy ideas, and for the benefit of those of you who don't know much about it I think this is a good time and place to enlighten you. Supported by the Government of the Colony as far as clothing, housing, feeding, and, I may say, doctoring are concerned, it is dependant in a large measure on the liberality of the public for those little luxuries and enjoyments that help to smooth the pathway of life, and that cast an occasional ray of the sunshine of gladness into the otherwise hum-drum existence of old men and old women who, from the infirmities of age and chronic disease and injury, have severed their connection with the bustle of the world, and

who, alas! are there waiting for the third and final great scene in life's drama. By coming here to-night you are aiding, how little or how much we know not, in cheering the lives of many who are rapidly descending into the valley of shadows, and for this little deed done in kindness, you may rest assured you will not be forgotten by those who appreciate your liberality.

With these few introductory remarks I will now proceed to the subject of the evening's lecture.

Perhaps one of the most interesting studies presented to us in all nature is that of MAN. Whether we look upon him as as the highest tyye of the animal kingdom—viewed from the Zoological standpoint—or whether we study him as possessing functions higher than those found in the lower animals, it is all the same: his study has been for generations and will be for generations the acme of all investigation. For man to study man seems but natural, and the saying of the ancients "man know thyself" is more of a command than a proverb. The "how I live, move, and have my being," has puzzled the philosophers of all ages. We make but slow progress, and are still on the threshold of the study of the *ego*. From the difficulties that surround its investigation the very nature of *life* is still unknown; and, with our present means of investigation, attempts to proceed further in this unknown land, result frequently in our floundering in the mud. When we come to consider the human mind, the moral philosopher, aided by the physiologist, has attempted to analyse the mental and moral faculties so as to produce some sort of classification. We speak of the

"will, the emotions, and the conscience," but yet our knowledge of these different attributes of the mind—some wrongly call them "functions of the brain"—is still in its infancy, although its study has extended back to the dim ages of the Greek philosophers. We grant, therefore, that the noblest study in Nature is Nature's greatest work—*man*; and, because in man, his mind is his chief characteristic—that which separates him from the brute creation, the inference is clear, that the study of man's mind must be the most interesting of all the sciences. It will not be my intention, however, to take up your time discussing to any length, the mental aspect of our subject: I am an anatomist first, a philosopher afterwards, and our study to-night will be almost entirely limited to the tangible and material brain rather than to the intangible subject of the mind.

You are all aware that the whole body forms a most complicated piece of machinery, every part so well knit together, and in their relations, one to another, so perfect, that no engineer, no architect has ever designed a machine, which for complicity of parts, and yet at the same time smoothness of working capability, ever approached it. In the living machinery which we call *man* there is no organ so delicate in structure, or so complex in function as the *Brain*. As found in man, the brain is the resultant of thousands — perhaps millions— of years' building up: each generation adds its contribution to the structure, so that in process of time we arrive at a more and more perfect design, making the interval between the brain of the lower animals—which is limited in its capacity of growth—and that of man

greater as the ages roll past. These improvements on the original plan of the brain—the result of civilisation and education—have produced changes so marked that there is as great difference between the brain of an educated man and that of a savage, as there is between the latter's brain and a monkey's. Although the size of the Savage's brain may be larger than that of the monkey, its component parts and its minute structure correspond very closely with the brain of the lower animal. You have all heard of Darwin and the evolution theory: how, when re-discovered—for it was known centuries ago—the Church put its veto upon it, the Pope issued Bulls against it, and a certain class of religionists clamoured aloud against this supposed Antichrist's doctrine. In spite of all this opposition, the theory, now no longer a theory, but a scientific fact, has flourished, until at the present day its enemies seem to have disappeared in the smoke of their own incantations! Now, in the whole study of nature there is no subject more convincing of the truth of evolution than that we are discussing to-night. As we shall see from the simplest cell of nerve matter, we are able to follow the brain's development through phases of increasing complexity of structure, until we have the completed organ which is found in man. And yet we cannot say that the human brain is perfect: it may be that in ages to come, man's mind may attain to that state of perfection, that he will be able to see in a glass clearly what he now sees only dimly.

The study of the brain necessitates a consideration of its evolution from its primitive form as met with in the lower animals: this is embraced in the study called Com-

parative Anatomy, and in investigating such an organ it is essential that we compare the anatomy of the human brain in its different stages of growth, with that of the lower animals. If we take an animal belonging to the lowest forms of animal life such as the *Amœba* and study it, we observe that it has no structure whatever that could be compared to a brain or a nervous system. Ascending in the scale of animal life we come to the Medusa order, and here we observe the first indications of nervous system, for in its finger-like processes or expansions a series of fine strings or fibres have been discovered that are considered as nervous in nature. Again, in the common earth worm minute nerve fibres surround each segment of the body. In the insect order we have the first indication of arrangement of nervous structures, for example, in the house fly there are three minute masses of nerve matter each with delicate nerve fibres attached, situated in the head, thorax, and abdomen respectively. The little mass of nerve tissue in the head may surely be considered as the first appearance in the animal kingdom of the rudiments of a brain, and we all know how intelligent some insects are—take bees and ants for example. This little head mass of brain matter gradually becomes more and more defined as we mount the ladder of Zoological life, until we reach the order of Mammals when the brain occupies a most important position and is enclosed within a special and protecting case. It is a curious fact that to a certain extent the spinal cord developes to a degree out of proportion to the growth *pari passu* of the brain. This evolution of the spinal cord seems to

reach its height in the frog which animal it is convenient to study owing chiefly to its commonness. If the brain be removed from a frog it will still live and respond to various stimuli. If we prick the brainless frog's leg it will pull it in; if it is placed in hot water it will endeavour to escape, but it does not leap away after we have given over annoying it; it lies down perfectly quietly unless again disturbed by any irritating stimulus which causes pain. We note, therefore, that in the frog the sensation of pain is referred to the spinal cord, that it is capable of exercising power of the muscles for some definite object viz., to remove anything irritating it. Were it possible in a man to remove his brain without causing death, he would feel no pain and his power over his muscles would be totally abolished. We conclude, accordingly from our experiments, that the spinal cord in the frog is not only spinal cord but likewise brain, and that it is the more important organ of the two; but as we progress on our evolutionary way, the brain increases in importance while the spinal cord remains stationary, or even retrogrades, so far as the functions of the two organs are concerned. We say, therefore, that the spinal cord in the mammalian order of animals, including of course man himself, occupies only a secondary position in the nervous system.

Having now reached the Mammalian order, we may take the dog's brain as a good example to consider. It is to be noted it is of fair size, simple in design, and presenting few of those lines and furrows that go to make the human brain so complicated an organ. Its general appearance, however, and its coarse structure are the same. On

the outside it is of a greyish creamy colour, bnt when cut it is found that this greyish colour extends only to a depth of from ¼ to ½ an inch, and the interior of the brain is for the most part of a pearly-white colour. The outer part is called the *cortex* or grey matter, and the internal portion is called the *white matter*; it is on the extent of the grey matter and on its complexity of structure that the higher functions of the brain depend.

In idiots and imbeciles, where the mental processes have been arrested in growth, this grey matter is of very little depth, the cells forming its structure are few in number, and the folds of the brain are simplified to compare with the brains of the lower animals. This grey matter or cortex when examined under the microscope is found to consist of cells varying in shape and arranged in layers, numerous bloodvessels, and a cementing material binding the various component parts together.

Let us now consider the human brain more carefully. We find that it is a large organ; much larger in relation to the whole body than the brain of the dog or in fact of any other animal. The first thing we note about it is that it consists of two halves—*hemispheres* they are called; that these hemispheres are united at the lower part, and that they are similar to each other in appearance and in general structure. Now let us take one half and examine it; we observe that the surface of the brain is broken up by numerous depressions or *fissures* as they are called, and that they are not alike in any two brains. This is so, to a very limited extent however, in every brain. We are able to differentiate the more important of these

fissures—the larger and more prominent of which divide the brain into different parts convenient for purposes of study. These large depressions divide the brain into lobes, and each lobe is again divided by shallow and less distinct fissures into parts called convolutions. The various lobes are named according to the position they occupy in the skull, and the convolutions are generally named in accordance with their position and their relations one to another in the lobes. That portion of brain filling up the forehead is called the *frontal* lobe; that in the middle and top of the head, the *parietal* lobe; that to the side and behind the ears, the *temporal* lobe; and that behind the head is named the *occipital* lobe.

The purpose of these numerous depressions which you observe on the surface of the brain is very evident. It is noted that they contain a grey matter, which I informed you formed the most important part of the brain, and that this cortex dips down into each of these depressions, forming folds, thereby giving a much larger amount of grey matter than could otherwise exist if the surface of the brain were perfectly smooth. This wonderful arrangement of the brain cortex is an excellent example of the axiom that "Nature abhors all waste of space." Here we have a dodge of nature to use up economically what little space she has at her command, and with what beautiful results does she accomplish this! for if this grey cortex, instead of being folded up in the comparatively small box of the skull cavity, had been spread out, it would cover an area several square yards in extent.

Still, considering the surface of the brain, we notice that within the past thirty years much has been done to elucidate the structure and functions of its various parts. In Germany, more than in England or any other civilised country, physiologists have made, and are making wonderful discoveries, and as a result of their investigation, we know that the brain can be mapped out into various areas or districts, each possessing a separate and distinct function, and exercising or dominating certain muscles, or sets of muscles, or certain senses, or mental faculties. Thus, we now know that the frontal lobe is the fountain-head of the intellect, and is the seat of disease in insanity, and remains in an undeveloped condition in idiocy and imbecility; that the temporal lobe is the seat of hearing and smelling; that a small area near the occipital lobe, to which the origin of the nerves of sight has been traced, is the seat of seeing, and that the parietal lobe exercises control over the muscular movements of the legs and arms. These areas or districts, which have been so carefully mapped out on the brain's surface, are called *centres*, and in them is originated the nerve impulse that results in movements or stimulates one or other of the senses. This nerve impulse can be very well imitated by the electric current, and it is by this means, in experiments on living animals, that such men as Hirsch, Victor Horsley, Ferrier and others have made themselves famous. When, in a living animal, a portion of the skull is removed over the site of any of these centres, and the centre exposed and stimulated by electricity, certain definite things take place. Thus if we stimulate the

occipital lobe—or that portion concerned in sight—a flash of light is seen : if the frontal lobe, pain alone is experienced and the animal may cry out. If the parietal lobe is exposed and stimulated, movement of the legs or arms takes place according to the exact part stimulated. It is as a result of this exact knowledge of the geography, and the functions of the surface of the brain, that modern physicians are able to localise or define the position of brain disease from the symptoms presented by the patient, and consequently surgeons have in many cases relieved suffering, or even saved life by operating in time on the brain and removing causes of irritation or disease. The brain is connected with all the muscles of the body by means of fibres or nerves along which—as along a telegraph wire—the nervous impulse passes. These nerves cross each other in the lower portion of the brain : that is to say, the nerves having their origin in the right half of the brain go to supply the requirements of the muscles on the left half of the body, and the nerves taking their origin in the left hemisphere supply the muscles on the right side of the body. Therefore stimulation of one half of the brain affects the other half of the body in its results, and disease on one side of the brain produces paralysis on the body's opposite side. This is what is called *cross-paralysis*, and only exists when the disease causing it is situated high up in the brain, above the site of the crossing or decussation of the nerves.

The cortex of the human brain is thicker or deeper than it is in the lower animals : in fact its depth and extent increase with the increasing intelligence of the animal.

When examined under the miscoscope it is found to consist of a number of layers of cells, each layer possessing cells of the same shape but different from those of the other layers, and each layer fulfilling different functions. It is known that these cells are in reality the origin of various nerves, in the same way as the cells of a battery form the starting point of telegraph wires, and that within these cells certain changes—whether molecular, chemical, or electrical is not ascertained—take place, which result in a current of a similar character passing along the nerve connected with the cell originating the stimulus, in the same way as the electric fluid is carried along the telegraph wire ; this current goes to the muscle supplied by that nerve,and as a result of this stimulus, the muscle contracts and gives rise to a movement. These cells in the cortex are likewise connected with other and similar cells in the brain, changes or stimuli pass between one and other, producing mental changes of different kinds. It is supposed that these cells specially concerned in our mental faculties are confined to the frontal lobe. Strange as it may seem, the knowledge of our very existence has its seat in these little cells! How very easy, therefore, it is to understand that owing to some alteration either in the contents of the cells, or in their relation one to another, insanity may occur, and our own identity be lost!

Phrenologists argue that, because we are able to localise certain functions on the brain surface, the portions of brain so concerned influence the external appearance of the skull to such an extent that they can

tell the character of a man, and his capabilities for certain employment or professions by merely examining his head. Now from the remarks I have already made, you can easily understand how false this doctrine is: that it is the quality of the contents of the cerebral cells that regulate and modify a man's mental capacity, and not either the number of the cells or the general size or conformation of the brain itself. Any condition of the brain, or of isolated parts of the brain, so developed as to make evident impressions on the surface of the skull and so alter the general shape of the head, is decidedly pathological, and may indicate serious disease of the brain. We admit, however, what is recognised as a well-known fact, that a broad and high forehead indicates great intellectual capacity, while a low, narrow, or rapidly receding forehead is as a rule associated with feeble mental powers. This latter form of forehead, together with a narrowing of the cross diameter of the head is frequently found among idiots, and is likewise the type from which our criminal classes are derived. In man, to show as it were his close relationship to the lower animals, it is a peculiar fact that as the mental powers decrease, he loses self respect, and his animal passions come to the front.

The total weight of the brain varies, and by no means corresponds with the intellectual capacity of the individual. While several men, such as Cuvier, the great French naturalist, and Sir James Young Simpson, the discoverer of chloroform, possessed excessively large and heavy brains, other men, just as famous, such as Napoleon the Great, were noted for having unusually

small brains. The average weight of the brain in a full-grown man is from 2 to 3 lbs., or 1-50th of the weight of the whole body. In women it is somewhat less; but I may allay the fears of my fair hearers by the consoling fact, as I said before, it is the quality and not the quantity that tells in the long run—the intellectual capacity and mental capabilities depending not upon bulk, but upon the number of the cells, their healthy condition, and the number and complicity of arrangement of the cortical convolutions.

The human brain is relatively heavier than it is in the lower animals. That is to say, take weight and weight of respective man and beast; in the former the brain represents a larger proportion of the body than it does in the latter. Further, the brain attains to its full development sooner than any other organ of the body. It is well supplied with nourishment—1-3rd of the blood in the whole body going to feed it—and in cases of starvation the brain is the last organ to suffer, every other organ giving way to it. In old age a general shrinking of the brain takes place; it becomes smaller, it atrophies, as it is called. As a result of this change in the size of the brain, there is a reversion to the child's brain; the character of the man alters and approaches that found in childhood—in fact he passes into the condition called dotage.

As the central organ of the entire nervous system, the brain is sympathetically affected in all diseases. What is it that causes the headache of biliousness, that causes the convulsions of childhood while teething, that causes the sleeplessness of disease, but functional disorders of the brain? You have

seen that even pain itself would not be felt had we no brains. Now in disease of any organ of the body some distinct change—some alteration in structure—is to be found in that organ; but in the brain it is different, for in many conditions that are recognised as disease of the brain, such as epilepsy, hysteria, and many forms of insanity, no alteration of structure is to be found so far as we are able to ascertain, and the brain is in a perfectly healthy condition. It must be remembered, however, that there are vital processes constantly going on within this head of ours: the blood circulates in a regular manner: these vague changes that I have described to you occur in the contents of the nerve cells, originating stimuli, and nerve currents are constantly passing from cell to cell, and from cell to muscle along the nerve fibres. It is, therefore, easy to understand how some alteration may occur in any of these processes, resulting in disease, and yet not produce any real alteration of structure, so far as our knowledge goes. We are in the habit of calling these states "functional disorders" for want of a better name; and the condition may aptly be compared to an engine in want of oil. There is nothing the matter with the engine; none of its works are broken; all it wants to make it work smoothly is a little oil.

I have said that the brain is in "touch"—in sympathy—with every organ of the body by means of what are called *sensory* nerves. We all know the miseries of a bilious headache—how the head burns and throbs, how we are unable to raise it, how light itself seems unbearable, and how irritable this condition makes us. What is

this but an example of the brain's sympathy with the disordered liver? Again the child's brain is excessively sensitive or sympathetic, the most trivial infantile ailments often producing severe convulsions; while the same disease in grown-up people would not affect the brain to nearly the same extent.

Speaking of children, perhaps there is no study more interesting than the investigation of what may be called "the dawn of intellect" in the little one—the mysterious awakening to life of baby's mental faculties: how the various senses of seeing, hearing, etc., come into being one by one; how the smile of welcome indicates the faculty of recognition awakening, and how the little one's emotions come to be expressed by the sunshine of laughter, the cooing of pleasure, or the shedding of tears—little drops falling like April showers!

The study of baby's mind is alike attractive, whether it be considered from a religious, a scientific, or an æsthetic standpoint, and infant psychology, if pursued in the right direction, teaches us many important lessons.

While in former years the only conscientious student in this field of labour was the mother, who rarely allows a passing change in baby's condition to escape her vigilant attention, and who watches intently the passing shadows across baby's countenance; now of late years "the scientific papa" has invaded the sacredness of the nursery with his armamentarium of investigating instruments, and, although the privacy and mystery of the nursery has thereby been sacrificed to the scientific spirit once for all, we have as a result of this invasion, many important contributions to

this most interesting study, such men as Darwin, Sully, and Froebel having made known to the world their investigations, whereby we know how we first came into being, so far as our mental relations with the world are concerned.

The question may be asked: "How does the mind develop in childhood, and in what sequence are the various mental faculties evolved?"

During the first two months of infant life the child leads a purely vegetative existence: its whole time is spent in eating (I should rather say drinking, only we are all tee-totallers!), sleeping and—shouting our bachelor friends would say—mother calls it crying. After two months certain motor phenomena awake our first interest in the baby: these to begin with are automatic and purposeless movements: then they appear to have some degree of intent—the grip of a finger held out to him is an example of this intentional movement in the child. During this part of the life history of baby, he seems to be able to appreciate things, for we have the crowing of pleasure, the cry of pain, not to speak of a general restlessness —the outcome of pure healthy vitality. Co-incident with these movements, what are called *reflex phenomena* appear, and may be said to indicate the first awakening to activity of the nervous system. A good example of a reflex act is the closing of the eyes when the hand is brought suddenly in front of the face. Now, in this case, what causes the eyes to close, and what is the *modus operandi* of this apparently simple act? As we shall see, the act is by no means so simple as one would imagine at first glance. What occurs is as follows: a

stimulus is caused by the sight of the rapidly approaching hand, an impression is made upon the sensitive retina, which is carried to that part of the brain cortex concerned in sight, along the sensory nerves called the *optic nerves*; this stimulus reaching the brain cells, produces a commotion in the contents of these cells, which is again transferred to the other cells in another portion of the brain concerned in muscular movements of the eyelids: as a result of this latter commotion within the cells a message is sent along the motor nerves which supply the muscles closing the eyelids, and in obedience to this reflected message the eyes close. It is to be observed that this seemingly complicated process occurs within a very short space of time, in fact that elapsing between the sight of the advancing hand and the closure of the eyes, and yet we are able by intricate machinery, to measure the speed at which nervous impulses travel along the nerves, and this speed is so enormous that we are hardly able to fully realise it. Thus in the case of motor nerves—these nerves going to muscles—the nerve impulse travels, in the case of man, at the rate of from 100 to 120 feet per second; while in the case of sensory nerves—those along which the stimulus travels from the muscles to the central nervous system, the brain or special end—it travels at the rate of from 280 to 290 feet per second. This complicated process—the reflex act, can be performed, however, without the existence of a brain at all. We saw how in the decapitated frog reflex movements occurred; how the impulse is reflected within the spinal cord, and in man while asleep and the brain is in a condition of

inactivity, tickling the soles of the feet will produce the reflex act of withdrawing the feet—the brain being in total ignorance of the act. These reflex movements, when occurring for the first time in a child, may therefore be considered as to a great extent automatic, and independent of the will; they have been compared to movements, the result of instinct, as found in the lower animals.

We now arrive at that stage of investigation where we require to study the first awakening of the intellect in the young child. We cannot tell the age at which this occurs: none of us can recollect incidents in our life history before the age of three; none of us can remember when the dawn of an idea, defined in character, first lightened up the previous darkness of a confused medley of vague perceptions, with their accompanying automatic and instinctive movements. Imitation would appear to be the first symptom indicating an awakening to life of the mental faculties of the child; this proves that the infant perceives movements in others; that he has learned to appreciate similar movements of his own body by the sensations they cause, and that he has previously formed an image in his mind of what that movement is to be. In this process the higher mental centres in the brain are necessarily brought into play, and the act of reasoning first takes place. By simple imitative acts then "baby begins to notice things," the mother will explain: he recognises the difference between his mother's voice and a stranger's, and he prosecutes studies, within his own mental sphere, in the vast fields of philosophy and physics of the nature of which we know little,

and, unfortunately, our little philosopher is unable to communicate to us. The development of these mental faculties in the infant is influenced and modified by many extraneous things, and, at this stage of the child's history, fear, love, or anger exercise a marked effect on the child's character. It is to be remembered that this influence—like all first impressions—is not easily eradicated, even after years of education. The law of imitation in the child as in many of the higher animals, is intensely developed, and the frequently noted similarity of a child's temperament to that of his father is simply the result of this infantile imitative influence. As the child grows his will power comes more into view; he is able to exercise a control over movements and functions that were previously of an automatic nature. Education and the regulating and modifying influences of his surroundings mould his character to fit the sphere in life to which he is called. In the mental education of the child it is necessary that his surroundings should be bright and cheerful, and his associates good-tempered and truthful; otherwise the child's character becomes depraved, and his after life shows forth the evil nature of his training. As the mind gradually developes—the different faculties of the intellect expand themselves, the child learns to appreciate his surroundings, is able to exercise reasoning powers, he becomes a responsible being, and takes his place for good or ill in the race of life.

When we consider what may be termed "the artificial education of the child" some thoughts arise. How is it that as children, we all hated school? Certain children—precocious and generally delicate, either in

mind or body, prove the exception to this general rule. We cannot get away from this fact that the healthy growing boy or girl detests the confinement of the school room. Is the fault to be found in the child, or are we to search for an explanation in the system of education carried on at the present day? Why is it that long confinement within the school-room produces headache in the child and makes him pale, and interferes with his growth? I believe that an answer to all these questions is to be found in our modern system of education, which renders the child's life burdensome to him, by a continual cramming of his brains with facts and data more or less necessary to him in after life, but terribly necessary to him in view of an impending examination, that hangs for ever over his head like the proverbial sword of Damocles; that gives him a fit of shivering every time he thinks of it, and that makes the night hideous to him by the ghastly dreams he has of the awful punishment in store for him should he fail to satisfy the examiner, and thereby diminish the *per capita* grant made to his teacher! The time was when our forefathers talked of "*blood-money*," but in this civilised century we know well, to our cost, what "*brain-money*" is.

I do not hesitate to say, and in my opinion I am supported by some of the most famous students of psychology living, that the present system of education adopted in all English-speaking countries, whereby a premium is given the master on the number of "passes" he secures, quite regardless of the mental capabilities of his pupils, is having a deteriorating effect on the intellec-

tual capacity of the race, whatever effect it may have on the individual. During a time when the growth of the body is rapid, and it alone requires all the nourishment it can obtain, the brain is kept at high pressure, cells that are but developing are required to do more work than they are physically fit for. And what is the result? The wonder is we don't see more examples of stunted specimens of humanity in our streets, but assuredly the result is embodied in the statement one so frequently hears: "Nowadays we are not able to accomplish the amount of work our grandfathers could do."

At a time when the child's mind is expanding, and when his little body is growing, his chief education should be that of an out-door life: the study of nature's beauties is surely better for the health of your child than having him cooped up among scores of other children, breathing vitiated air, for six hours every day, and having his delicately-constructed brain crammed with facts relating to King Henry VIII and his wives, or Euclid's idiotic axioms, none of which will ever prove of real value when the time comes that he must plunge into the sea of life's struggle!

In an educational centre like Grahamstown, I feel it my duty, occupying the position I do—as a student of the mind and a physician to minds diseased—to warn parents against this baneful system of education and school examinations of modern times. No two brains are made exactly alike, and no two brains are capable of doing exactly the same amount of work; accordingly, if you endeavour to force the weaker brain to undertake the same amount

of work that the stronger brain is capable of doing, you produce certain changes within the brain, functional at first, and shown by the existence of occasional headache, due to congestion; but afterwards the tension becomes so great that the strings burst asunder and there is a complete mental break-down.

The correct system of education is what I may call "individual training," in which each pupil is put to a certain amount of work within his mental capacity, and may be examined on the same. The system of standards in a school would then be dispensed with, so far as collections of scholars are concerned. The true standard is that amount of work within the capacity of any one pupil, and not any collection of pupils.

We have now considered the development, architecture, and general functions of the brain, and education of the mind, and our next question is, the nature of a departure from the normal condition of mind. This subject is included in the wide field of the study of "insanity;" but as our time is limited, we are unable to do more than merely touch upon it. As the poet says:

"What is madness, but to be mad?"

We cannot define the condition. What would be insanity in one would only be eccentricity in another. I may state, however, for your information, that it requires a *mind* to be insane. Some of us have no minds, and it is only in persons whose minds—whose intellectual faculties—are of a very high degree of development that we fear a mental break-down. The finer the structure the more liable it is to injury, and so in the case of the brain cells—the more delicate their

conformation, the more complicated their contents—the more liable are they to be influenced by surroundings that, in the cases of other and coarser brains, would have no effect. You are accustomed to look upon madness as something beyond the common. Some of you think the insane must be possessed of the evil one; this is all a delusion on your part; there is nothing more wonderful in a madman than there is in a man with a a broken leg, and the curiosity some of the public show to see the interior of an Asylum, and its inmates, is a most morbid and unhealthy one, and one which I take every opportunity of discouraging; need I say that I incline to look upon this curiosity itself as an indication that the person's mind is in an unhealthy condition, and so far as I know, may be on that threshold —that border-land which separates, with no marked defined line, insanity from sanity. Live a healthy life, have healthy surroundings, abstain from everything that tends to upset your mental equilibrium, and there is no fear of your either being curious to see mad people, or to be mad yourself.

I could dwell for hours on this subject; but the time at my disposal is at an end. I trust I have enlightened your minds on things you knew little of before, and if so I have fulfilled my duty; you have fulfilled your's by contributing so liberally to the cause in whose interests we called you here this evening, and if the coffers of the Chronic Sick Hospital Entertainment Fund are filled by this evening's collection, I conclude that we shall be all perfectly satisfied with the result.